

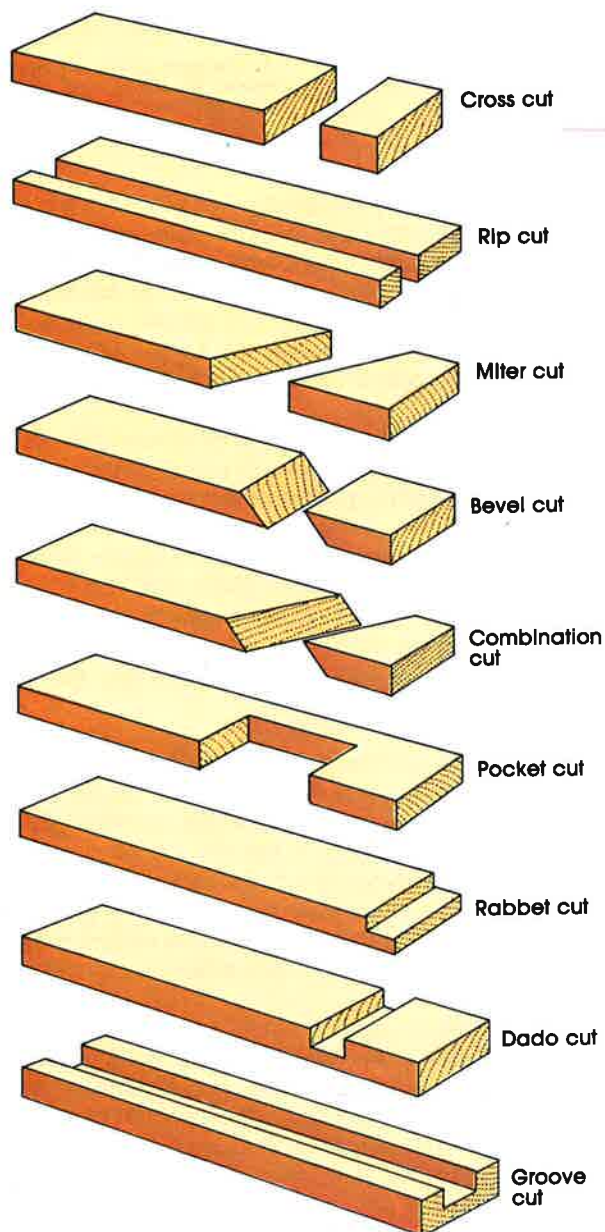
BASIC SAW CUTS

Sawing is probably the most basic skill required of any carpenter. The degree of precision you achieve with a saw can make the difference between shoddy and excellent work. If you know how to make the basic cuts with each of the many types of saws, you are well on your way to expertise.

The basic cuts are actually quite simple. Except for the occasional circles and curves, every saw cut is simply a straight line. Depending on the project requirements, you can cut with the grain (rip cut) or across it (crosscut) or at an angle (miter or bevel cut); you can also cut all the way through the wood or only partially (as in a dado). And several of these basic cuts can be combined.

Examples of the basic cuts are illustrated on this page. The next section outlines the basic wood joints and how to cut them. Subsequent sections describe how to select and use a variety of handsaws and power saws.

Basic Saw Cuts



Saw Cuts for Wood Joints

Many ingenious methods of joining two pieces of wood together have been devised over the centuries. Making a good wood joint requires skill and patience, but the results are worth it; the joint is both strong and beautiful. Putting wood together with some of the basic joints or angle cuts covered here can take you from the realm of a basic carpenter to that of a skilled cabinetmaker.

This section describes 11 joints that are basic to woodworking as well as various related cuts. The traditional way to make the cuts for these joints is with a handsaw (preferably a backsaw because it is quite rigid for precise work), a chisel, a drill, and a hammer. These techniques are illustrated here. However, all the cuts for joints can be made with power tools as well. While power saws will make the cuts more efficiently than a handsaw, many craftsmen believe they will not make as fine or accurate a cut. However, two types of cuts can be made with great accuracy on both table and radial arm saws: the dado and the groove. This is because both of these saws can use a special dado blade to make the cuts. The other power tool widely used for making dados, grooves, and rabbets is the router.

Instructions for using power saws to make the cuts described here are included with the sections on those saws later in this chapter. Choosing a power saw or a handsaw is really a matter of personal preference, but no matter what tools you choose, the cuts themselves and the joining techniques are the same.

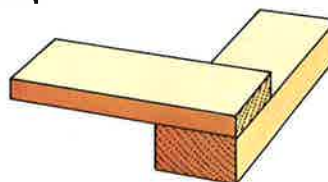
Overlap Joint

This is the simplest of all joints and involves little craftsmanship, although it is quite functional. It is made by cutting boards to length and laying one board on top of another, usually at right angles to each other, and then fastening them together. You can refine and strengthen this joint by using screws and glue instead of nails.

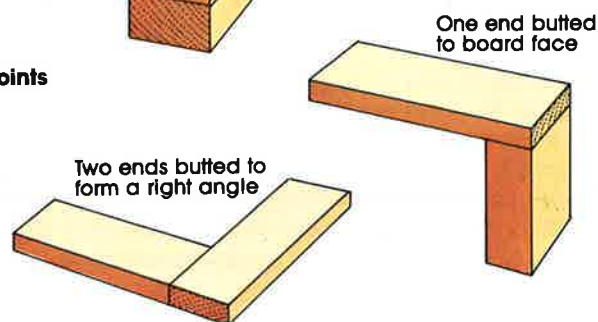
Butt Joint

This is another simple and commonly used joint, but one with relatively little strength. When joining a butt end to a board face, cut the butt end perfectly square so it will fit smooth and tight against the face of the other board. Join

Overlap Joint



Butt Joints



by nailing through the face of the board into the butt end, or by toenailing (see page 19).

If you want to butt two boards together at the ends to form a right angle, such as on a screen door, first put them together on the workbench. Next, drill two holes through the face of one board and into the butt of the other. Put glue in the joint and then screw it together. The screwheads can be hidden by countersinking them and covering them with wood putty. You may wish to use dowels instead of screws (see below).

Doweled Joints

If you plan to make numerous doweled joints, consider buying a doweling jig. It usually comes with complete instructions and will allow you to do very precise work.

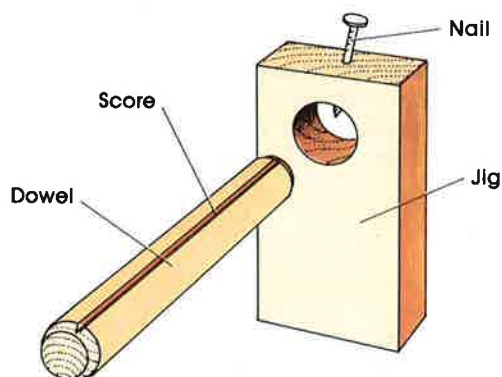
Use at least two dowels on any joint. In order to join two pieces of wood together smoothly, the dowel holes must be drilled in precise locations for a perfect match. The easiest method is called open doweling; a more difficult method is known as blind doweling.

Open doweling involves clamping or holding together the two pieces, then drilling through the outer edge of one board into the butt of the other. The hole in the butt end should be half again as deep as the connecting board is thick. The dowel should fit snugly, but not too tightly. Drill a hole in a piece of scrap and tap the dowel part way in to check the fit.

Bevel the end of the dowel slightly with a file so it will start into the hole smoothly, without splintering. The dowel must also be scored one or more times to allow air and excess glue to escape.

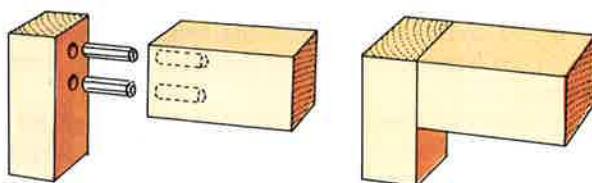
With the two pieces still clamped together after drilling the holes, squirt glue into the hole and then tap the dowel all the way in. Trim the excess dowel off flush with the outer edge and sand smooth.

Dowel-Scoring Jig

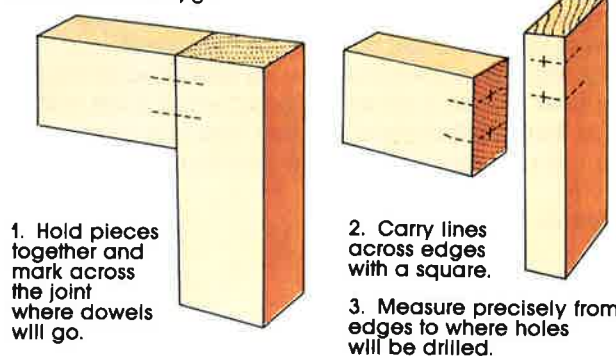


To score lengths of doweeling quickly, drill a hole slightly larger than the dowel about an inch from the end of a scrap 2 by 4. Drive an 8d nail from the butt end of the scrap so the nail point just protrudes into the hole. As you hammer the dowel through the hole, the nail point will score the length of the dowel. Score each dowel at least twice to provide an escape channel for air and excess glue.

Blind Dowel Joint



Marking the position of dowel holes without a dowel jig ...



Blind doweling means joining two pieces of wood so that the dowels are invisible. To do this without a jig, clamp together the two pieces to be joined. Check that all edges are flush, then mark the dowel locations across the joint, on both pieces. Separate the two pieces and, with a square, carry these lines across the board edges to be joined. Measure precisely where the holes are to be drilled on each edge.

With a piece of tape on the drill bit to mark the proper depth, drill the dowel holes in each piece $\frac{1}{16}$ inch deeper than the dowel length to provide room for glue at the rear of the holes.

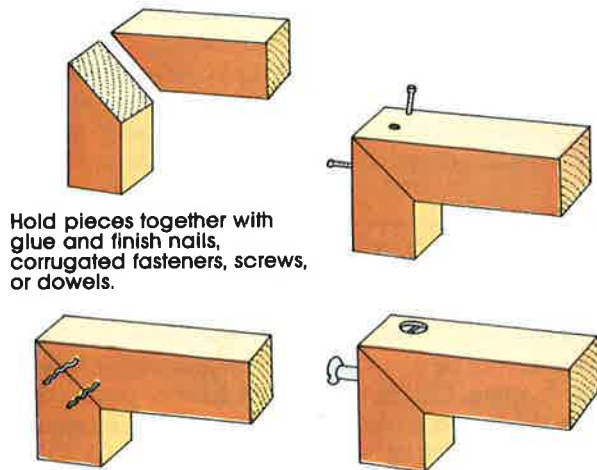
Cut the dowels to length, drive them into the holes on one side, and then tap the other piece onto the exposed dowels. Do this first in a dry run to check for a flush fit before gluing. If your alignment is bad, fill the holes with dowels, cut the excess flush with the edges, and start over.

Miter Joint

This joint, in which two pieces of wood, generally cut at 45 degree angles, fit together to form a right angle, is commonly used for picture frames, molding, and fine cabinet work. A 45 degree angle can be laid out on a piece of wood with your try square or combination square, both of which have such angles built into them (see page 59). When you cut freehand, mark the board both across the face and down the side so you can follow accurately with a backsaw.

You may wish to use a miter box rather than cutting freehand. The miter box can be either an inexpensive wooden one or a more elaborate (and expensive) metal one that adjusts to cut any angle between 30 and 90 degrees. In either case, place the wood to be cut in the box, hold it firmly with one hand, then put the backsaw in the 45 degree angle slot and cut.

Miter Joint



Hold pieces together with glue and finish nails, corrugated fasteners, screws, or dowels.

Two pieces of mitered wood can be joined in several ways. The simplest (and weakest) way is to glue both faces, pull them tightly together in a picture frame clamp (see page 46), and drive two corrugated fasteners across the joint on each side. A method that is nearly as simple but a little stronger is to glue the faces and nail them together. More strength is gained by drilling and then using glue and screws. For an even more professional appearance, put them together with dowels as described on page 22.

Full-Lap Joint

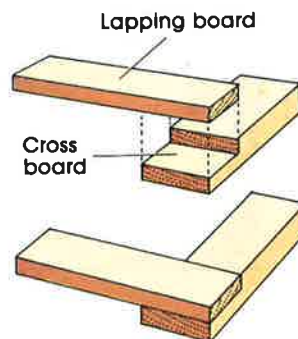
This is a fairly simple but strong and attractive joint. The chief consideration here is that the board you cut must not be notched more than one-third its thickness; otherwise it will be too weak. Use a thicker board if necessary. To make the joint, place the lapping board in place on the cross-board and mark its position. Use a square to draw your lines. Measure the thickness of your lapping board and draw those measurements on the cross-boards, again using the square. Cut the sides of the notch and then use a chisel to break out the piece. Remember to hold the chisel with the flat side along the bottom line and the chisel's bevel facing the wood to be removed. Put the lapping board in the notch and fasten, usually with glue and screws.

Half-Lap Joint

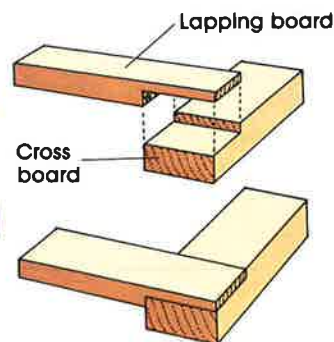
This is essentially the same as the full-lap joint, but a shallower notch is required because you also notch the lapping board. Start by measuring the thickness of the lapping board and draw a line through the center, using your square. Transfer this measurement—half the thickness of the lapping board—to the cross-board. Cut the cross-board notch. Then cut the lapping board notch. Fasten the joint together, usually with glue and screws.

Half-laps can be used very effectively to join boards in the middle, at right angles on the ends, or as an extension of each other. The latter use is appropriate when two large beams must meet over a supporting post.

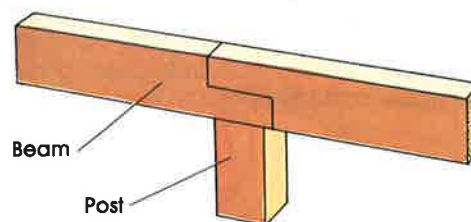
Full-Lap Joint



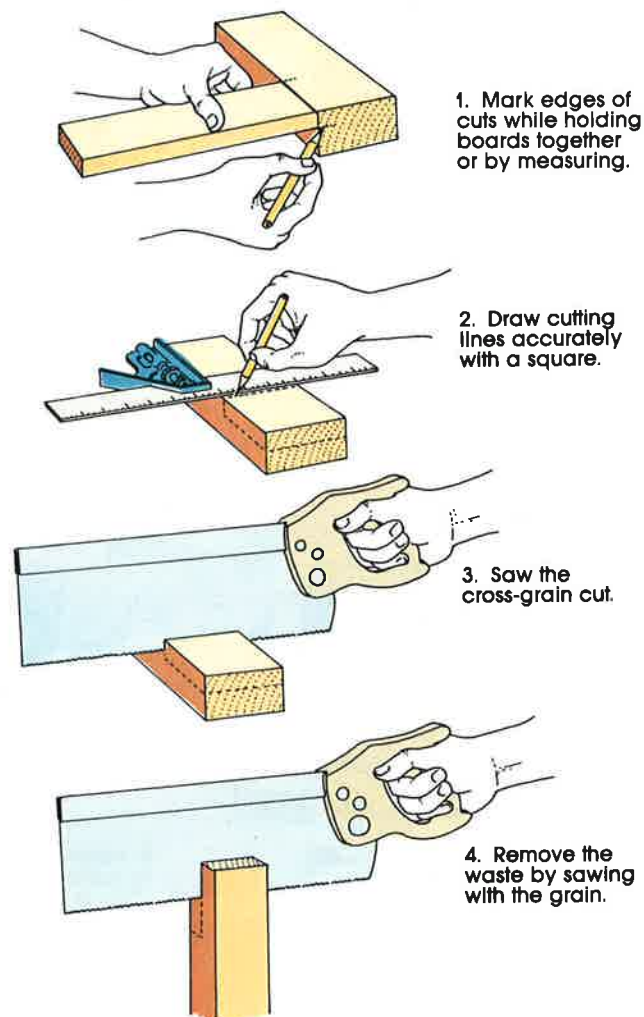
Half-Lap Joint



Half-Lap Joint



Cutting a Lap Joint with Hand Tools



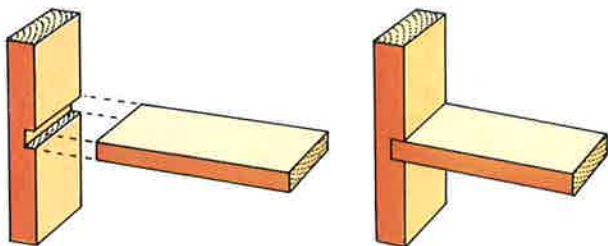
1. Mark edges of cuts while holding boards together or by measuring.

2. Draw cutting lines accurately with a square.

3. Saw the cross-grain cut.

4. Remove the waste by sawing with the grain.

Plain Dado Joint



A *dado* cut goes across the grain of a board, whereas a *groove* goes with the grain. Dado joints are used to set the butt end of one board into the middle of another board. Dado cuts provide support, such as for shelving. They are best done with dado blades or a router, but a saw and chisel will suffice if you follow the instructions given here.

Using a square, draw two parallel lines across the face

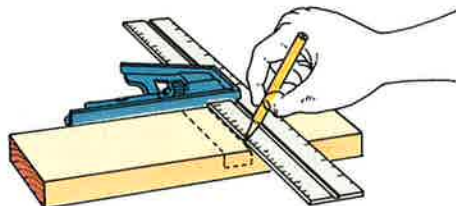
of the board to be dadoed, representing the exact thickness of the board to be inserted in the notch. Mark the depth of the cut required on the edges of the board and cut it. The depth of the cut should be no more than one-third the thickness of the board.

Then chisel out the dado, starting from one edge, with the chisel's bevel up, and work up toward the center of the board. Repeat this process from the other edge. Then turn the beveled edge down and remove the remaining waste.

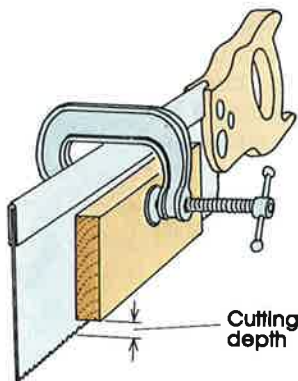
Groove

As stated above, a groove is made just like a dado, except that it runs with the grain rather than across it. Grooves are commonly used for drawer sides. If the groove is longer than your backsaw, clamp straight edges, such as 2 by 2s, along the line to be cut. This will help keep your saw directly on the line. Cut one line to the proper depth, then move the guide to the other line and cut it. Use a chisel to remove the waste wood.

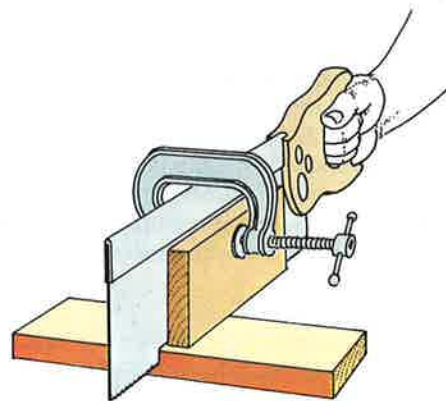
Cutting a Dado or Groove with Hand Tools



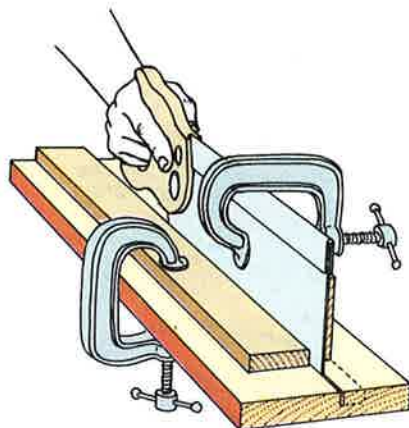
1. Mark and draw cutting lines with a square and/or a straight edge. Dado should not be deeper than $\frac{1}{3}$ the thickness of the board.



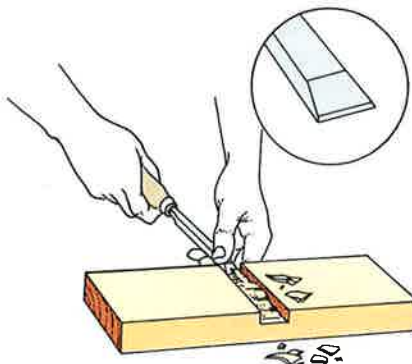
2. Clamp a guide board to your saw. The amount of saw below the board should equal the depth of the dado or groove.



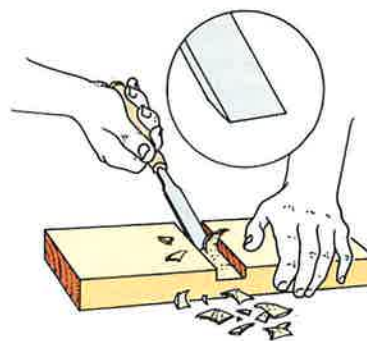
3. Cut the sides of the dado to the depth of the guide board.



4. The sides of a groove, even one longer than the saw, can be accurately cut by clamping another guide board to the work.

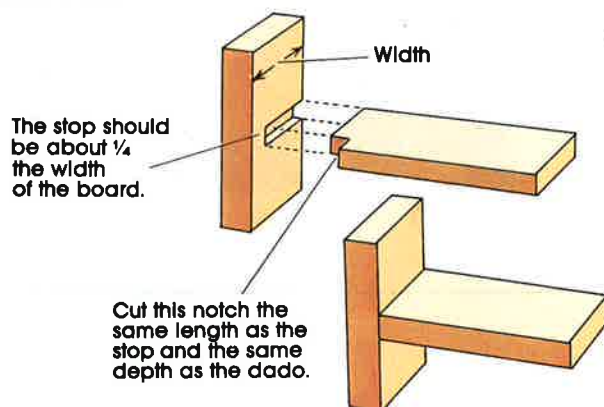


5. Remove most of the waste by working from each side at an upward angle toward the center. Hold the chisel with the bevel side up.



6. Clean out remaining waste and smooth bottom of dado or groove with the bevel side down.

Stopped Dado Joint



Stopped Dado Joint

The stopped dado joint is frequently used for shelves so that you don't see the joint from the front. It is most easily done with a router or with a dado set on a table or radial arm saw, but you should also know how to make this joint with a handsaw.

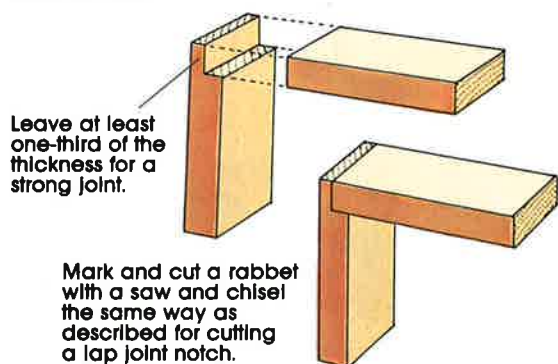
First draw parallel lines on the board to be cut the exact thickness of the cross-member. The dado stops just a short distance from one edge of the board, about one-fourth of the board width. To make room for a handsaw to begin the cut, chisel out a small section near the stop. Saw this piece to the proper depth and chisel out the waste wood. Remember to keep the beveled side of the chisel facing the waste wood.

Measure the length of the stop on the supporting board and then cut a notch that size in the end of the cross-member. Apply glue to the end of the cross-member and slip it into place.

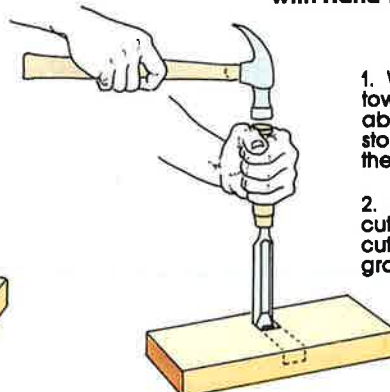
Rabbit Joint

This joint is quite easy to make and provides a strong, finished appearance. It is an excellent choice for making drawers. Basically, it is a half-lap in one board that fits over the butt end of another. For adequate strength, the rabbit cut should be no deeper than three-quarters the thickness of the board. Use a square to mark the lines to be cut. First cut the depth of the rabbit; then, with the board held in a vise, make the vertical cut. Put the boards together with glue and finishing nails or screws.

Rabbit Joint



Cutting a Stopped Dado or Groove with Hand Tools



1. With the flat side of the chisel toward the cutting line, remove about one inch of waste at the stopped end to allow room for the saw to operate.

2. Continue by making saw cuts and chiselling as if cutting a regular dado or groove.

Mortise and Tenon Joint

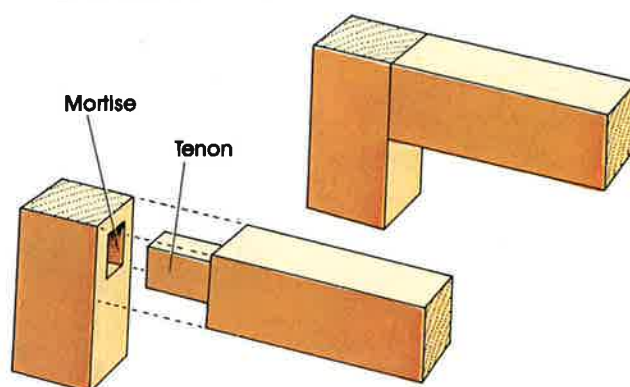
This joint, commonly used in making furniture, is nearly invisible when done properly. Make the tenon first; the mortise will then be made to fit that tenon.

The tenon should be one-third the thickness of the board. Its depth is determined by the thickness of the board that is mortised. The mortise should be no more than two-thirds the thickness of the board. So measure the board that will be mortised and mark your tenon depth accordingly. Place the board in a vise, butt end up, and divide the butt into three equal sections. Carry these lines down both edges of the board the depth of the tenon. Using a backsaw, first make the two vertical cuts. Then place the board on your workbench and cut the board faces.

At this point you have a basic tenon, but its width still matches the board's width. You can add a little finesse to your work by trimming the two outer edges of the tenon so the shoulders all have the same depth. Measure the depth of the existing shoulders and then transfer these measurements to the tenon edges. Use a square when drawing the lines. Make the two vertical cuts first and then cut the shoulders.

For the mortise, place the butt of the tenon on the edge to be mortised and mark its outline with a sharp pencil. Alternatively, divide the edge to be mortised into three equal parts, with the center portion to be removed. When you need to mortise a door frame for a lock, measure the width of the bolt and mark the corresponding portion to be removed on the frame.

Mortise and Tenon Joint



The smoothest means of removing the waste wood in a mortise is with a chisel. Work with the beveled edge toward the waste wood. Keep the edges vertical as you work down to the proper depth. Carefully measure the tenon to find the proper depth, then make the mortise $\frac{1}{16}$ inch deeper to make room for glue that will be compressed at the back.

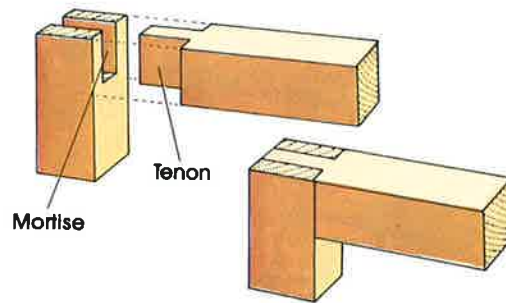
The mortise can also be cut quickly by drilling a series of holes. Put tape around the drill bit to mark the proper depth, and stop drilling when the tape reaches the board. The bit should be $\frac{1}{16}$ inch smaller in diameter than the mortise opening. After the holes are drilled, use the chisel to square up the mortise edges.

Before applying glue, tap the tenon into the mortise with a mallet that will not mar the wood. When you have done any necessary trimming for a snug fit, apply glue to the butt end and sides of the tenon and tap it into the mortise.

Open Mortise and Tenon Joint

This is a simpler version of the standard mortise and tenon, but equally strong. The tenon is made as described above. The mortise is easier to make because most of your work

Open Mortise and Tenon Joint



is done with a saw. Place the piece to be mortised in a vise, butt end up, and divide it into three equal sections as if you were making a tenon. Cut with a backsaw down the two vertical lines to the depth of the tenon. Now chisel out the center portion. Keep the beveled edge of the chisel toward the waste wood. Turn the board frequently so you work from both sides toward the middle. This will help you keep the base of the mortise flat. Tap the pieces together in a dry run to check for a smooth fit before applying glue.

Cutting a Mortise and Tenon with Hand Tools

